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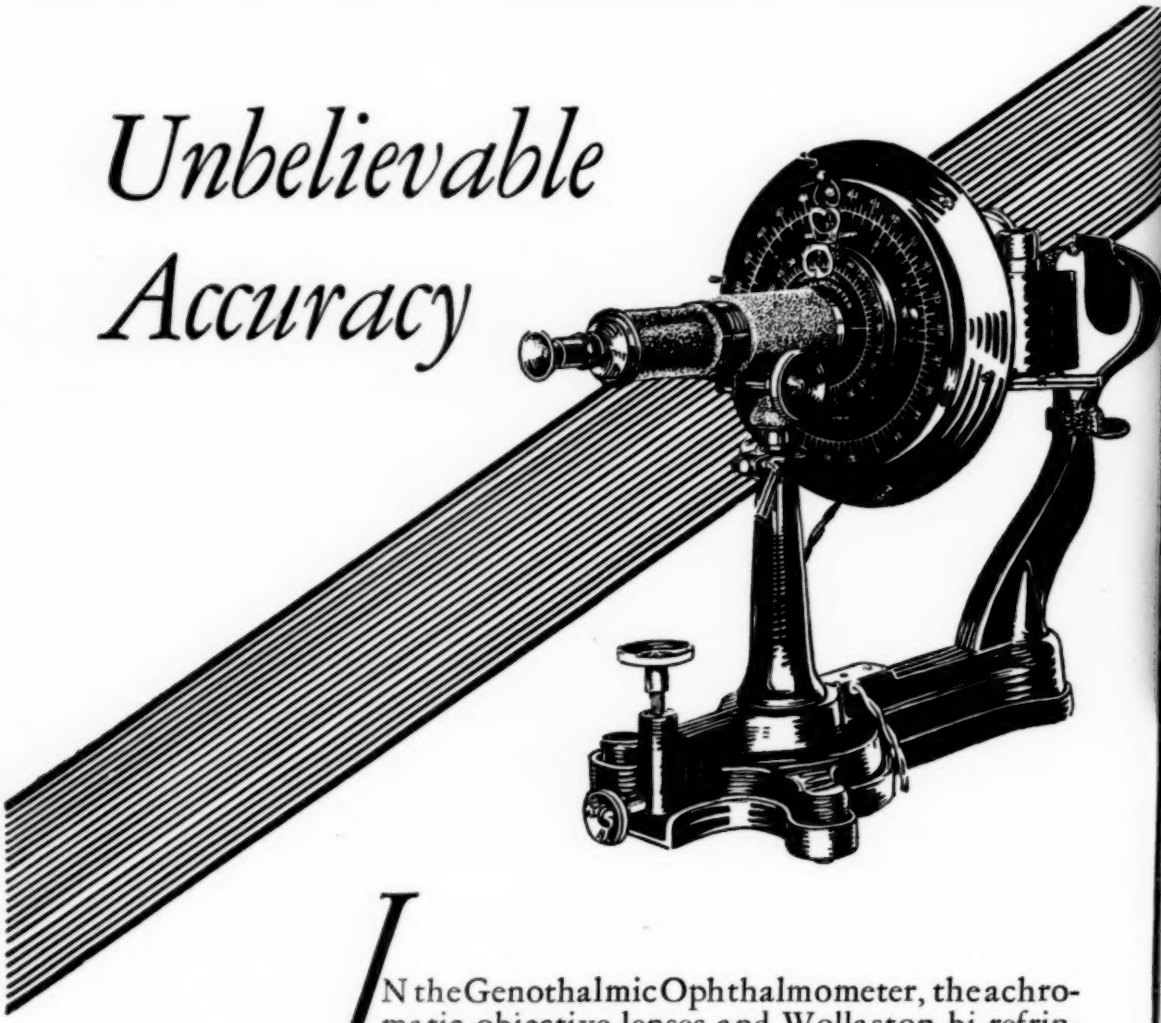

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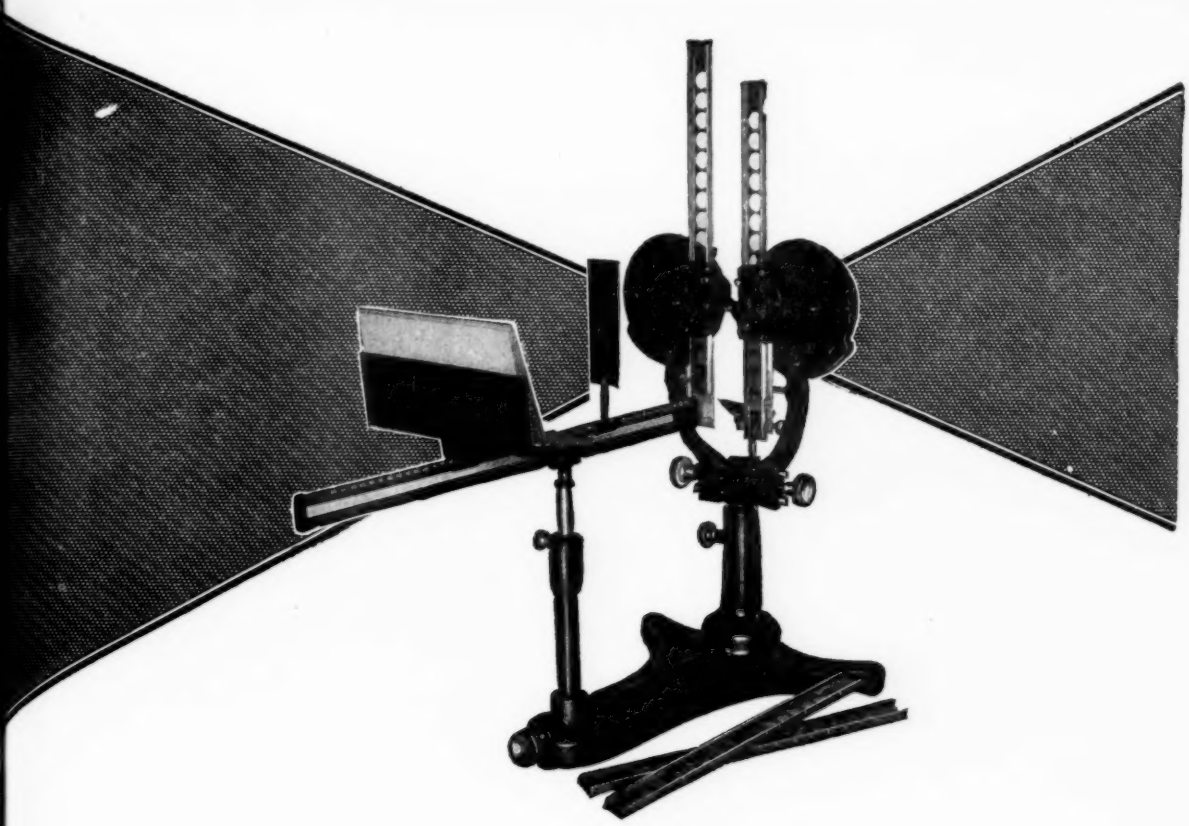

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AMERICAN JOURNAL OF OPTOMETRY
Vol. 4 OCTOBER, 1927 No. 10

OCULAR MYOLOGY

J. W. Parker, Opt. D.
Kansas City, Mo.

In taking up the study of the extrinsic muscles of the eye it is fitting that we should first consider the structure, action and requirements of muscles in general. By requirements I mean the care or treatment necessary to keep them in good condition.

To introduce a complete deliniation of the anatomy of muscles into an article of this kind would require too much space, make the reading tedious, and accomplish no good purpose. We should know, however, that muscles, like all parts of the body, are made up of cells; that these cells, or at least part of them, are miniature storage batteries which must be constantly recharged. That like other batteries they are constantly wearing out and must be replaced. The recharging process is accomplished through the nerves while the removal and replacement of worn out cells is taken care of by the circulation. Two of the most important points to remember are these: A contraction of a muscle retards the circulatory action, i. e., so long as the contraction lasts. Alternate contraction and relaxation promotes circulation. The second point is: Dead cells quickly become toxins and if not promptly removed through the blood stream they weaken the muscles. It is because of this fact that rotary prisms lead to wrong conclusions. The toxic effects of worn out cells and the need for the recharging of active ones is so rapid the muscles involved become weak before their normal maximum strength has been measured. The "jump" system allows a momentary relaxation during which a fresh supply of cells and energy is brought into action.

Much confusion has arisen lately through contradictory definitions or classifications of voluntary and involuntary muscles. For practical purposes at least it would seem best to accept the definition given in Gould's medical dictionary: "Voluntary—under the direction of the will." Accepting this definition and then realizing that some muscular actions may be voluntary part of the time and involuntary or perhaps more explicitly reflex under certain conditions, we should be able to get along without much confusion.

All muscles deteriorate from lack of use and the ideal use for a muscle in order to keep it in good condition is one in which the periods of stimulation and relaxation are of equal duration.

No muscle can be used up to its limit of power, either from a structural or energizing standpoint without harm. A reserve of 33⅓% or more must be maintained to avoid excessive fatigue.

Much as I dislike to introduce a new term or to attempt giving a different meaning to a term in common use, I feel that it is necessary to call attention to one term which we are using wrongly every day. We are constantly talking about eyestrain when we really mean "fatigue." Gould defines strain; 1, sprain; 2, tension. He defines sprain as "a violent straining of ligaments." Actually straining a muscle means putting it under sufficient stress to rupture or injure it structurally. A little thought will convince us that none of our eye muscles, except through some accident, become stretched to this extent. What our patients are suffering from, therefore, is not eyestrain but eye-fatigue.

It will be taken for granted that our readers are all familiar with the action of the extrinsic muscles of the eye and we will next consider the various causes of imbalance.

The most common cause of muscular disturbance is excessive accommodation. The next is, perhaps, faulty fusion which in turn, is often due to amblyopic spots in the macular field. Decentered lenses or wrong fitting frames is another common cause. Wrong mental attitudes are another very common source of muscular imbalance. After these come occupational habits, focal infections, struc-

tural defects and systemic disturbances.

Making the Diagnosis

It goes without saying that in every case we should first make a strong effort to determine the underlying cause of muscular disturbance. That we fail occasionally is inevitable but this should not cause us to fall into the habit of treating the symptoms and neglecting the cause. Our medical friends are being censured by thinking persons for indulging too freely in this practice. Let us not make the same mistake.

Excessive Accommodation is indicated when we find an esophoria. If the esophoria is greater at the reading point than for distance it indicates presbyopia. An active mental condition is also apt to cause esophoria but we can differentiate between the mental and accommodative stimulus by noting the effects of additional plus lens power.

Faulty Fusion Stimulus is indicated when the power of adduction depends almost wholly on the accommodative stimulus. Also, when by stereoscopic tests there is imperfect stereoscopic vision and especially where amblyopic spots are found in the macular field. To find how much the patient's adductive power comes through the accommodative stimulus, first take the adduction at 20 feet and with refractive errors corrected. The amount of adduction thus shown comes from the fusion stimulus. Now take the adduction at the reading point, or, what is better, add to the distance correction a pair of minus spheres equal to whatever accommodation the patient uses in reading. The difference between the amount shown by first and last test is that of the accommodative stimulus.

Occupational Influences are to be suspected when we find esophoria for distance and exophoria at the reading point. Also when there is a lack of flexibility and a complaint of the muscles feeling sore. The patient is apt to be troubled with a "bilious" feeling and an aversion to outdoor exercise.

Structural Defects are strongly indicated when, in spite of exercise or change of lenses, the deviation remains the same. Structural defects of any consequence are very rare.

Focal Infections nearly always cause a wide variation in phoria tests taken on different days and more often affect the vertical than lateral muscles. Always suspect them in hyperphoric cases.

Systematic Disturbances of an acute nature are apt to cause erratic changes in the muscles as shown by either the phoric or duction tests. Chronic troubles affecting the muscles are most likely to weaken all ductive powers.

Mental Causes are perhaps the hardest of all to diagnose. Over-activity of the mind tends to cause esophoria while, in a general way, the phlegmatic mind is associated with exophoria. There are exceptional cases, however, in which the patient, working under high pressure, several hours per day, has acquired the trick of completely relaxing when the opportunity presents itself. I know one such case where, under certain circumstances the exophoria runs as high as 19 degrees at the reading point. Get this man thoroughly animated and nearly all the exophoria vanishes. I might add, this man shows about the same amount of exophoria without glasses as with, although he wears +1.00 D. Sph. for distance with the same amount added for reading. Where mental conditions affecting the muscles are suspected the best plan is to encourage your patients to talk. Sooner or later they will say something which will give you the desired information. As an example: A young man showed a weak adduction and several degrees of exophoria. The distinguishing feature of the case was an extremely slow reaction. After fusing a prism base out, a removal of the prism would cause two lights to appear and a lapse of from ten to 15 seconds would be required to restore single vision. Prism and stereoscopic exercises increased the adduction and gradually shortened the period of reaction. The general physical condition was fair and a sluggish reaction not compatible with the patient's age. I encouraged the young man to talk about himself and his affairs with the result that he volunteered the information he had "broke" with his sweetheart a short time before coming to me.

It is natural that we treat such matters with more or less levity—unless we happen to be one of the parties, but to a naturally serious minded young man a "break" of this nature with his

best girl is as momentous as it would be for the average business man to go bankrupt. In either case the temporary fit of despondency would manifest itself through the ocular muscles.

Weak Sursumduction. The sursumductive power is something to which too little attention has been paid. So long as one does not wear glasses it matters but little whether it is a matter of one degree or three. The minute glasses are prescribed, however, this function deserves careful attention. In spite of this, I will venture the guess that in 95% of the cases it is never taken. Where both lenses are of equal strength the sursumduction is not called into play except in those cases where the lenses have been carelessly decentered vertically, or, where the frame gets out of adjustment throwing one lens higher than the mate. This is something which is happening continually and where the lenses are quite strong the effects are serious. Three degrees sursumduction power is the maximum in 95% of our cases. Quite often it is only one to one and a half. Decenter a 5 dioptre lens 2 millimeters and you get a prismatic effect of one prism-dioptre. Place a perfectly centered pair of 5 dioptre lenses in a frame adjusted to hold the optical center of one lens too high by 1 millimeter and the other too low a like amount and we have the same effect. If the patient has but 2 prism-dioptres of sursumduction we would be forcing him to constantly use 50% of it to overcome the error in adjustment. If he had 20 prism-dioptres of adduction a similar error in getting the pupillary distance of the glasses too wide would add a burden of but 5%. Now, when we realize that some patients have but one-third the normal sursumductive power we can begin to realize the necessity for increasing the power if possible and for seeing that the glasses are kept in line.

Hyperphoria, a condition where the visual line of one eye tends above that of the mate, also strains the sursumduction and is often slow in responding to exercises. Part of our failures in attempting exercises of the vertical muscles is due, no doubt, to the average trial case containing nothing weaker than 1 degree prisms. Where the sursumduction is but 1 degree the placing of a two degree prism call for so much effort the muscles refuse to make the attempt. A 1½ degree prism might stimulate the effort and after a few successful trials we could then pass on to the two. Where possible, we should always increase the sursumduction even though we find it advisable to prescribe prisms for the hyperphoria.

(To be continued)

LATENT HYPERPHORIA REVEALED BY VIRTUAL OCCLUSION

R. J. Pearce, Opt. D.

Leaksville, N. C.

Patient, male, age 28, came to me complaining of being nervous, always tired, and needing far more sleep than the average individual. His eyes had always troubled him more or less and he had worn a correction of some sort since 1919. During this period he had had his eyes examined four times and the following corrections were prescribed: First, O. U. plus 0.37 D. Cyl. axis 90. Next, O. U. plus 0.25 D. Sph. ⊃ plus 0.25 D. Cyl. axis 90. Some time after this a pair of plus 0.50 D. Sph. ⊃ plus 0.25 D. Cyl. axis 90 were prescribed and finally a pair of O. U. plus 0.25 D. Cyl. axis 90 were resorted to. None of these corrections gave entire satisfaction, but any or all of them seemed to help matters a little. The last change made was so prescribed to clear distance vision which had been somewhat blurred, but he noticed that while he saw better he was not as comfortable.

In May of this year I examined the case. My dynamic skiametry findings with fixation at 33 cm, gave a neutralization of the reflex with a pair of plus

3.25 D. Sph. ⊃ minus 0.25 D. Cyl. axis 180. The tonicity tests showed 1 degree of esophoria at 6 meters and 4 degrees of exophoria at 33 cm. This test was made without a correction before the patient's eyes. On placing a pair of plus 1.00 D. Sph., before his eyes and making the same tests I was surprised to find that an orthophoria existed at both the near and the far point.

Now, according to Tait, who in his paper, "The Clinical Treatment of Ciliary Hypertonicity," which appeared in the Optical Journal and Review of July 14th of this year, said that a plus 1.50 D. Sph., should be subtracted from the dynamic skiametry findings, with fixation and working distance at the 33 cm point, providing that the physiologic exophoria is less than the average, or normal 6 degrees. Accepting Tait's theory, this would indicate that the patient's actual hyperopia is about 1.50 diopters, although his latent hyperopia is but 0.50 of one diopter, the amount he will accept subjectively.

With this in mind I prescribed the following correction for constant wear: O. U. plus 1.25 D. Sph. ⊃ plus 0.25 D. Cyl. axis 90. This naturally fogged him somewhat but as it was expected he did not complain and used the correction for one month as instructed.

Upon reporting back at the end of this period as requested I found that the blur was now intermittent rather than constant as it had been when the correction was first prescribed. He claimed that when he rested there was less blur present than when he was fatigued. Upon reexamining him I found that with the correction in place there was 1 degree of esophoria present at 6 meters, and 3 degrees of exophoria present at 33 cm. Uncorrected, however, there was 4 degrees of esophoria at 6 meters and 1 degree of esophoria at the near point. This would indicate that the use of the correction had uncovered some latent esophoria. There was, however, at this time, no manifest hyperphoria at either the near or far points.

The patient also reported that his eyes felt better, but that he still did not seem to have entire ocular comfort. He claimed that upon closing either eye he immediately felt better. He also at times read with a patch or shield over one eye for hours without glasses and without discomfort. This indicated that a latent phoria might be present so I decided to virtually occlude the left eye it being the nondominant eye and see if any latent phoria could be made manifest. To accomplish this I prescribed the following correction: O. D. plus 0.75 D. Sph. ⊃ plus 0.25 D. Cyl. axis 90. O. S. plus 4.00 D. Sph. The patient was instructed to use this for a ten day period.

At the end of this time the patient returned for a reexamination. He reported that although he had not been able to see very well, he had never had such complete visual comfort before and that it seemed as though he had much more energy and needed much less sleep than before. Upon reexamining him I found 1 degree of left hyperphoria, both at 6 meters and at 33 cm. This was manifest both with and without a correction. A post-refraction two days later disclosed the same findings and I therefore prescribed as follows: O. D. plus 1.25 D. Sph. ⊃ plus 0.25 D. Cyl. axis 90. O. S. plus 1.25 D. Sph. ⊃ plus 0.25 D. Cyl. axis 90, ⊃ 1 degree prism base down. This correction gave the patient complete comfort, and he has used it since that time. I have examined him on two occasions since prescribing the above and the left hyperphoria continues to be manifest.

Conclusions.

1. Virtual occlusion is an efficacious method of making latent phoria manifest. In this case no suspicion of hyperphoria existed. All vertical tonicity tests gave negative results and the patient did not complain of dizziness, which is supposed to be a noncommittant of hyperphoria. Some vertical duction tests were made on the patient, but no positive results were obtained as the duction powers fluctuated too much.

2. Virtual occlusion does not work very much of a hardship on the patient. It is not noticeable to others as it would be if the eye were really occluded with a shield. In this case the patient preferred virtual occlusion with visual comfort to binocular vision with discomfort.

COLLOIDS

Arthur L. Koch, B. S.

St. Paul, Minn.

The varied properties of colloids and the abundance with which colloids occur make their study of great importance to all scientists and particularly to the chemist. In this paper, only a general survey is intended, since the subject of colloids has so many ramifications that it would be impossible to cover them in detail. The applications of the principles are broad; they cover all branches of chemistry and have a wide technical application.

The life of man is intimately bound up in colloids. All living matter is primarily colloidal. Plant and animal cells are aggregates of colloids; blood, sap and juices are colloidal solutions, for the most part. The important properties of soils are due to colloids. The blue color of the sky is simply refraction from dust colloids. Even the rocks are often solid solutions of colloids. Indeed, colloids are indispensable to man.

Thomas Graham was the first scientist to investigate colloids. In 1861 he published the results of his discoveries in the Philosophical Transactions of the Royal Society. Concerning the difference between crystalloids and colloids, he says, "They appear like different worlds of matter, and give occasion to a corresponding division of chemical science. The distinction between these kinds of matter is that subsisting between material of a mineral and the material of an organized mass." Graham experimented with the diffusion of solutions through membranes; those substances that diffused rapidly, he termed crystalloids; those substances that did not diffuse or diffused slowly, he termed colloids. His researches covered only part of the field of colloidal chemistry; he only experimented with two types of colloids, those that he called gels and those he called sols. Since Graham's time, many of the old theories upon which he based his conclusions have been invalidated. His definitions and conclusions must be modified to comply with new theories. Moreover new apparatus has been designed, old methods made more delicate, and new properties and discoveries recorded. Due to a great many experimenters, a conception of colloids has been developed.

This modern theory of colloids assumes that colloids are simply a state of matter. Colloids always occur as mixtures, the dispersoid and the dispersion medium. Dispersed matter is grouped into three classes, depending upon the size of the dispersion; the molecular, the colloidal and the course dispersion. In this classification, the size attributed to colloids is between .1 and .001 diameters. Dispersoids of this size have very special—so-called colloidal properties. Since colloids are simply a state of matter any substance may occur in the colloidal state; a fact that is proven experimentally. However, some colloids are more easily prepared than others.

There are several classifications of colloids. A substance is said to be an emulsoid if it is a colloidal mixture of a liquid in a liquid; whereas a suspensoid is a colloidal mixture of a solid in a liquid. A sol is a colloidal mixture that is liquid in appearance; a gel is a colloidal mixture of high viscosity. Ostwald classifies colloids according to the state of the dispersion medium and the dispersoid:

(1) Solid + Solid (ruby glass).
(2) Solid + Liquid (opal).
(3) Solid + Gas (pumice).
(4) Liquid + Solid (suspensoids).
(5) Liquid + Liquid (emulsoids).
(6) Liquid + Gas (foam).
(7) Gas + Solid (cosmic dust).
(8) Gas + Liquid (fog).
(9) Gas + Gas

There are a number of physical properties that are peculiar to colloids, and upon which their usefulness depends. Such properties as: adsorption, catalysis, diffusion, coagulation, and peptization, attract a student's attention. All such properties are due directly or indirectly to the size of the colloid.

Upon decreasing the size of any substance, the surface per unit weight increases rapidly. Thus if a cubic centi-

meter, whose surface is six square centimeters, should be pulverized to colloidal dimensions, the surface would be approximately six hundred square meters, or a million times the original surface. It is due to this great increase in surface that the phenomenon of adsorption is attributed. Sugar is purified and the color removed by means of animal charcoal. This carbon, which is in a colloidal state of division, adsorbs the impurities. The surface attraction of the colloid binds the impurities to the colloid and can be filtered off.

Also, the catalytic effect of colloids is probably due to the large amount of available surface. When metals, such as platinum, palladium, nickel or iron are used as catalyzers, great care is taken to obtain the proper fineness of the particles of catalyzer. The required size generally falls within the colloidal range.

One of the first properties of colloids to be studied was their lack of diffusion. If a hydrosol is placed within a parchment sack immersed in water, the colloidal particles do not filter through the membrane, as the salts of ordinary solutions do. Such a method, to separate salts from colloids, is termed dialysis. Similarly, salt will diffuse through a gel whereas a colloid will not. Thus if a small amount of copper sulphate is poured into a test tube on top of set agar-agar, the color of the copper salt slowly extends throughout the whole gel, showing that the salt diffuses through the gel. But, were a colloid dye introduced into such a test tube, the color would remain at the point of application, showing that the colloid did not diffuse. In explanation, it is assured that the interstices in the membrane, or between the gel particles are not large enough to permit the passage of particles of colloidal dimensions; whereas the smaller molecules and ions find easy passage.

Colloidal solutions are often marked by intense coloration. Colloidal gold, silver or platinum show this to a marked degree. Brilliant green, blue, red or violet solutions—colloidal solutions—of gold can be prepared. The color of the solution seems to be a function of the size of the dispersoid; for in the red solution the size of the colloidal aggregate is smaller than in the violet, it is smaller in the violet than in the blue, and largest in the green. A similar color variation occurs on varying the size of colloidal platinum or silver solutions. Organic dyes also follow a similar law; for the lower members of a dye series is often yellow or red, whereas the higher homologues are blue or green.

Still another property of colloidal solutions is their Tyndall effect. If a small concentrated beam of light is passed through solutions of different types, it is found that the course of the light is defined by the particles of colloidal solutions, just as a sun beam is defined by the dust particles in the air. In a true solution, however, no such effect can be noticed for in that case the solution is homogeneous.

Although particles of colloidal size are not visible under the microscope, it is definitely known that they are in rapid motion. Suspensions or emulsions that are close to the limit of visibility in size show that so-called Brownian Movement; the small particles describing zigzag paths in very complicated and erratic fashion. It is also an experimental fact that in solutions, colloidal as well as normal, a definite pressure, so-called Osmotic Pressure, is exerted. This pressure is due to the bombardment of the colloidal particles in rapid motion.

Colloids are often metastable forms. Thus we may have a barium sulphate hydrosol, where large quantities of $BaSO^4$ are apparently dissolved in water. Such colloidal solutions are easily thrown out of solution, or coagulated by the addition of a small amount of some salt. This coagulating effect of salts can often be nullified by the previous addition of a protective colloid, such as gelatin. In this case, the gelatin seems to surround the particles of hydrosol, leaving on surface for the action of the salt. Coagulated colloids may often be brought into solution again by first washing out the absorbed salt that coagulated it and then adding a very dilute solution of a certain salt (often the same salt that was used for coagulating) which peptize the colloid, transforming it into a sol.

In analytic chemistry, there are a number of applications of the principles of colloids. In grameometric work, precipitates are often flocculent;

they bring down occluded salts that cannot be washed out. Such flocculent precipitates are coagulated colloids; the occluded salts were adsorbed on the colloid before coagulation. By using methods to prevent the formation of colloids, or by crystallizing the precipitate, a pure substance is obtained. Often a precipitate will stay in solution as a colloid, if conditions are favorable. The use of concentrated solutions, the additions of salts, the aging of the solution and the heating all tend to form the crystalloidal instead of the colloidal state. The color of colloids of the noble metals are often used in qualitative and quantitative determination of those elements. Such tests are very delicate: two billionths of a gram of gold may be detected by the coloration effect of its colloid.

The principles of colloids have a very wide technical application; since there are very few manufacturing operations that do not deal with colloids. Optical materials as well as building materials, steels, clothing, foods, even paper and ink—they are all made partially, at least, of colloids. Most technical processes follow colloidal principles, although manufacturing methods were worked out arbitrarily before the colloids were studied. I shall select a few technical applications for brief review.

When rocks weather, colloids are formed, mainly in the form of gels. In very plastic clays, there may be as much as 1½% of inorganic colloids, composed of hydrated silica, silicates and the hydroxides of iron, aluminum, and manganese. When clays are mixed with water, pugged, and shaped into bricks or porcelain, it is the colloids that hold the clay together and give it the valuable property of plasticity. On drying, the colloids are dehydrated, losing most of their properties, on burning in a kiln, the colloids are entirely destroyed.

The process of tanning leather is entirely colloidal, the hide is built up of colloids, the tanning solutions are colloidal. In the process, the raw hides are treated with very dilute sulphuric acid, whereupon the hides take up water, they swell to a blubber-like state. The hides are then treated with brine solutions which dehydrates them, making them tough and leather-like. Finally they are treated with tanning solutions of organic or inorganic colloids. The dye is absorbed by the colloids in the hide. The swelling and dehydrating property of hides can be exactly duplicated with gelatin. Dry gelatin swells more in dilute acid than in water. Gelatin gel is dehydrated by slightly acid brine solutions.

In general, then, colloids are an important state of matter well worthy of study. They are widely distributed on the earth, being the basis upon which all life is built. They have a series of very interesting physical properties, depending upon their size. The applications of the principles of colloidal chemistry find important use in technical applications.

MUSCULAR INSUFFICIENCY

Chas. I. Saks, Opt. D.

Syracuse, New York.

The cases of Reoccurring Convergence Insufficiency referred to by Doctor Koch in his paper on that subject in this Journal of last month, are not at all surprising when one considers that when a function has been performed in a certain manner (correctly or incorrectly) for a great number of years, there is a habit formed. These same habits may have existed far back into the lineage of an individual, giving rise therefore to inherited tendencies. Why then must we be surprised when a patient returns with the same trouble that we had corrected some time before?

Let us take a case of true convergence insufficiency in a person of twenty-five years of age. During twenty-five years this true convergence insufficiency existed. (I am excluding any ill health or local pathology.) How can we expect to correct a habit of many years of standing in twenty or thirty treatments? This is against all physiological laws. If a person has performed an act so many times in a well beaten nerve path, it will take a good long period of innervational treatments to build up new synaptic relationships. Not only must the new habit be built up, but the old habit must be broken down as much as is possible.

Take the case of a boxer—he goes in training for a few years so that he can box with precision. Now, let him lay off for a few months. Upon resuming his training, he will find that his accuracy has been dulled, his timing of blows very poor, his judgment of distance entirely off, etc. Before he can improve his boxing, he must first catch up to the point where he left off.

So it is with ocular myological insufficiencies, as well as with any "muscular" insufficiency of any part of the anatomy.

It has been the writer's experience so far that optical aid must be given in conjunction with ocular innervational exercises. I have in mind some cases of very high and stubborn esophoria. Before these patients would respond to treatment, I gave them all the base In (incorporated in the prescription) that they could stand. Where they were engaged in close work, extra prismatic segments, also Base In, were added for stimulating purposes while they were doing their close work. For instance, the distance correction would be O. D. plus 2.00 D. Sph. ⌣ 1 degree prism Base In. O. S. plus 2.00 D. Sph. ⌣ 1 degree prism Base In. Add O. U. 2 degree prism Base In., Plano. Of course in cases of anisometropia, a vertical prismatic element was added, this calculated for a point 8 mm below the optical center of the major lens. The Base In prism added in the reading portion gave immediate relief. After the correction was worn about a week or two (depending on the case) innervational exercises were started. After a while the prismatic segments were removed and the prism in the major lens was left to remain. Some of these cases are now two years old and these patients report absolute comfort. I have reference to esophoric cases only.

The average course of treatments in my experience lasted about one month, the treatments being given three times weekly. Of course, these esophoric cases were given Base In treatments only. By the end of a month, considerably more plus or less minus was required in the final correction.

These patients are always instructed to report back in six months.

It will be found that when the limiting amount of Base In prism which is worn before the eye, is suddenly removed, fusion takes place much more rapidly than when the limiting amount of Base Out prism is suddenly removed. By limiting amount I mean the greatest amount of prism tolerated to maintain single binocular vision. This is another way of saying that positive convergence can be brought into play much more quickly than negative convergence. This may easily be seen by the following experiment.

"E" (observer's eye.)

The observer's eye at E first looks at point A (any small object in the room) holding a pencil vertically in either hand, direct the gaze from A to B (which is the pencil in your hand). Notice how quickly the two images of A fly apart. Now direct the gaze back to A and it will be noticed how slowly the double images of A come together and how slowly the double images of B separate. This is true except in cases of high esophoria, true convergence insufficiency or where the patient's health is subnormal.

Cases showing a lateral orthophoria most often need oculo-prism treatments, Base In, because there is too close an association between accommodation and convergence.

The duction tests bring this out nicely. Dr. Peckham's technique in the duction tests is a masterpiece in scientific attainment. It is as follows: obtain an F-L card and place it on a refractor head rod, or the Kratometer rod. The card is placed at 35 cm from the patient. Then turn in enough prism (usually base out) until the F and L are superposed to form E. The F and L have a box of squares above and below. Assuming there is no suspenopsia, add additional prism, increasing the steps about 1 prism diopter over each eye at a time, telling the patient to inform you the moment the E separates to F and L. Also ask the patient to tell you when the little squares above and below the E begin to blur. Make notation of amount of prism before patient's eyes. Proceed increasing until the E breaks. This will have to be repeated two or three times to get satisfactory reading. Let me repeat again: make notation of prism power before the eyes at the point of blurring and at the breaking point. The difference in prism power between the blurring and breaking point will tell if there is the proper amount, excess or deficiency, of association between accommodation and convergence. If the breaking point follows immediately or simultaneously with the blurring point, then there is an insufficient interlocking between accommodation and convergence. In this case, prism Base Out treatments must be given. If the blurring occurs, upon the increasing of the prism Base Out, then there is too close an interlocking between accommodation and convergence. If the blurring occurs at 5 or 6 prism dioptres less than the breaking point, then there is a very good relationship between accommodation and convergence.

The next thing to watch closely is the point of recovery when the breaking point has been reached. If the point of recovery is only four or five prism diopters less than the breaking point, even though the duction may not be very high, then this patient will have comfort. A high duction is not necessary, provided:

1. The relationship between adduction and abduction are satisfactory, about 3 to 1.

2. The relationship of the blurring and breaking point are about 4 degrees to 5 degrees apart.

3. The point of recovery is only about 4 degrees less than the beraking point.

The writer wishes to emphasize that this technique is not original. It has been developed and perfected by Dr. R. M. Peckham.

Another point I wish to bring out regarding treating cases of muscular insufficiency is that convergence development will automatically take care of accommodative deficiency. If there is not the proper amount of interlocking between convergence and accommodation, the patient will not be comfortable until there is.

THE MACULA AND THE FUSION SENSE

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from the

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The necessity and origin of the Macula date from the same causes, and are inseparable.

At a certain stage in the evolution of the Mammalian family we may reasonably suppose a desire and demand for finer discernment in the visual act. Following the course of evolution, new conditions arise which of necessity cause a cessation of old habits and the adoption of new ones bringing about and evoking fresh desires.

In relation to the Simiae (man and apes) in the very early stages of their evolution one great condition was necessary, namely, improved vision, and notably that their visual faculties should be far superior to those of contemporary animals. The actions of rapid climbing and swinging in mid-air, aiming to catch branches of adjacent trees, are dependent upon many improved features—hands, prehensile tail and particularly a finer sense of discrimination.

The Simian in his native forest is handicapped for speed in running over the ground, and his abilities for climbing by means of hands and tail are considerably enhanced by an improved visual apparatus to enable him to escape the clutches of his hereditary foes, this last factor being of paramount importance.

Synchronizing with this physical development he advances a stage mentally. In order to climb and distinguish his particular food, swinging from branch to branch in mid-air and generally disporting himself, seeing and acting quickly in the moment of danger, it was necesary for him to possess fine powers of discernment, to see the branch clearly to which his hand was directed. His many acts of volition in the tree tops could not be executed without exceedingly keen perception, so much so that the very existence of his species depended upon a first rate visual equipment. The human race may, in fact, owe its very existence to this factor. In all the mammals below the Simiae we find a large sensitive area on the Retina (corresponding to the tapetum) in which there is a more uniform distribution of rods and cones, and owing to this arrangement motion is quickly and easily distinguished in a higher degree than in the case of the Simiae. To these mammals this sense is sufficient to counter-balance the lack of perception of detail peculiar to the Simiae, and in addition many animals are endowed with other advantages such as powers of scent and others peculiar to their species, which compensate for those deficiencies, and the refractive condition of such an animal's eye is sufficient for its ordinary needs. In contrasting the refractive condition of the Simian eye with the mammal's eye, we note that whereas the Simian eye in the wild state always attains the emmetropic state, that of the remainder of the mammals is always hypermetropic, in which distant vision is good but near vision poor. In pointing out that these mammals are always hypermetropic, it should also be stated that the Macula is never present on account of the area of diffusion in front of the tapetum, the function of which does not concern us here. It is somewhat remarkable that there was a great step made by the Simian family in the elimination of the tapetum.

In the Simian, another stage in his history was reached, due to the demand for finer discernment calling forth a simultaneous advance in mental development. I refer to the development of the Macula by means of which fine perception, detail and colour, as presented to the animal in question, was achieved. The one development called forth a corresponding increase in mental efficiency, and the human eye can be regarded in a measure as an index to mental capacity. Incidentally, the dioptric system adapted itself to this new condition and the formation of a highly specialised area —the Macula. The attainment of all three events over a period has taken place in conjunction.

The necessity of the one brought the conformity of the others.

The Macula, to be the means or channel of discernment, must have evoked a more suitable refractive condition than had hitherto been the case to cause light to come to a definite focus on the Retina.

Another development also came about; the extrinsic muscles assumed increased functions and enabled the Simian to move his eyes according to the direction from which danger might appear. I make reference to a later explanation in this thesis in respect of the extraocular functions responding to the motor reflex actions due to a proficient Macula conveying the necessary stimulus and causing the response to the motor nerve centres. Thus we have three great advances in the development of the educated eye:

1. A more perfected refractive condition.
2. Development of Macula.
3. An associated action of extrinsic muscles necessary to cause one and two to complete their functions.

To dilate upon how the refractive condition was improved, I do not intend to discuss this point further than by suggesting that the pressure applied by the extrinsic muscles would bring about the desired lengthening of the globe and a simultaneous stimulus applied to the ciliaries, thus rendering the eye by degree emmetropic.

This new condition gave rise to closer association of the functions used in co-ordination, together with an increase of mental appreciation.

With the development of the eye there has been a corresponding development of the cerebral area to which the sensory stimulus is carried by the optic nerve fibres, and one evidence of mental advance is indicated by the increase in sensory stimulus caused by the Macula and the consequent response of the motor functions as affecting the extrinsic muscles, which until this stage are quite restricted.

Having described the origin and need of a Macula, my remarks are now to be devoted to the development of this highly specialised centre.

It is generally admitted that each stage of development of the embryo bears a relation to the acquisition of faculties attained in the evolution of the species and that these faculties are repeated in the embryo development and persist after birth.

In the reproduction of any species, every stage of evolution is repeated by an unfolding of the physical characteristics of its progenitor.

This applies to the Retina, which is predisposed to repeat previous history and awaits only the last stimulus light before being awakened and assuming its function.

At the commencement, let us note the contrast between the eyes of the two groups of the Mammalian order, the Simiae, to which belong men and monkeys, on the one hand, and on the other the remainder of the Mammalian family.

The eyes of the Simiae differ from the remainder of the Mammals in the following respects, particularly:

1. Shape and refractive condition.
2. Constitution of Retina.
3. Shape of pupil.
4. Movements of the eye-ball.

The refractive condition of animals other than the Simiae in the wild state is always hypermetropic. The iris is not round, but invariably oval in shape. The Retina also has a uniform distribution of rods and cones over a large area corresponding to the metallic shining background, the tapetum, to which it lies in apposition. Therefore, there is not the necessity for the eye to move when viewing a moving object on account of the large pupil not contracting under these conditions, and by reason of the large sensitive area of the retina on any part of which the object can be discerned sufficiently for the immediate purpose.

By this ararngement the Mammal is enabled to perceive moving objects in a remarkable way, which does not obtain in the Simiae. On the other hand, also, on account of the defects so evident in the dioptric system, it is plain that he is quite incapable of discerning objects in detail, and the form sense is very deficient.

The possession of the form sense, illustrative of the fine discernment of detail, is characteristic of the Simiae, and shows a great advance over the vision of contemporary animals, and this sense depends upon the Macula.

The development of the Retina has been an educative process, and it follows that the desire to observe objects in detail is passed on through succes-

sive generations as an hereditary instinct, and the Macula is of comparatively recent date in the order of living beings.

There is good reason to assume a post-natal development of the mechanism of the human eye, particularly of the retinal elements.

The eyes of several animals, cats and dogs, do not open until several days after birth, the eyelids being closed for this time.

In the case of the human eye and all members of the Simiae, it is quite reasonable to say that there is a post-natal development. Do we not know that the growth of the teeth does not take place until some time after birth? The stomach cannot establish its fullest functions until several years have elapsed. The stomach of an infant cannot digest the kind of food which an adult does. Mental development is also a gradual process. There are many analogies that can be quoted.

My plank argument in this section of my paper is to show that the entire functioning of the eye is due directly to the incidence of light and that its influence on the development of the Retina is the key to the whole of the situation.

If we take the eye of a child, we find that it is as undergrown as are the other members of the body. Incidentally, from failure to recognise this fact much mischief can be done. The eye of a new born babe is apparently complete in all its parts, but it has precious little vision. It may be weeks before the infant will notice the stimulation of light, and this can be absent for two or three weeks. The globe is small and flattened, and the whole of the development is dependent upon proper use and balanced stimulation, and a very slight disturbance of the normal stimulation will arrest the growth of the infant eye, such as bad or excessive light.

As to the Macula, there are excellent reasons for assuming that its development is not complete at birth, but is in an immature condition and awaiting further stimulus before it can assume its functions in the fullest sense. And I intend to show that its future condition and true functioning depend entirely upon the stimulus of light impinging upon it.

The refractive condition of the newly born child gradually becomes adapted by use to conform to conditions whereby light is so refracted as to impinge and become focussed upon a certain area. I assume that light passing through the dioptric system of the eye striking the Retina acts as a stimulus, causing the development of the percipient elements and thence the function. An index to a true functioning Macula is seen by the pupillary reaction. This is the first sign of Retinal stimulation. At birth, the reaction is nil. As the weeks go by a slight contraction is noticeable, indicating a slight stimulus of the Retina responding to light, and gradually as time goes on the pupillary reaction becomes stronger in proportion to the increased stimulation of the Retina. This is due to reflex action via the Third Cranial nerve.

At birth, we have an eye inert, the principal portions of the organ are present, some are fairly well developed, and others are awaiting further stimuli before reaching the full state of maturity, and true functioning cannot take place before complete development, and I submit that the Retina at birth is not completely developed but is awaiting the incidence of light to awake its functions or to bring some of the Retinal elements into being. The incidence of light on the Retina we will assume awakes it from its dormant condition and starts the cycle of events. After stimulation by light the nerve fibres carry the impulse to the Brain Centres which, when properly organized, cause a return message to the ciliaries and extraocular muscles via the Motor Nerves. As a consequence, we get the ciliaries in action controlling the lens in adjusting the refractive condition. The iris regulates the amount of light by contracting and the movements of the globe are controlled by means of the extraocular muscles. The functions are awakened and the eye is now in a dynamic condition.

This is effected by reflex action caused by the direct influence of the Retina, and particularly by the Macula when developed. The Primary Optic Ganglia to which the impulse is carried preside over the ocular motor centres and thereby reflex action results, so vital to the other ocular functions as mentioned. As time passes by

we see all these functions gradually harmonise.

Light upon the Retina can be likened to light falling upon a bud and calling forth the final act—the unfolding. Without light the bud would never open, and, in the same way, without light the percipient elements of the Retina would never be brought into being.

As to the properties of light, it is admitted beyond any doubt that in a very great measure we have elicited the fact that it possesses wonderful properties in stimulating growth. Although not claiming that light is capable of causing spontaneous growth, yet it is one of the greatest influences in developing life, whether of the animal or vegetable kingdom. The action of rays of light upon animal life as well as with plant life are highly beneficial as well as necessary.

In discussing the properties of light in this respect, one is unable to be definite in assessing its peculiar properties except in a very general sense.

We are safe in assuming that light is vital to life and that it stimulates growth. But when we enquire deeper into the physiological action of light, we are in the realms of uncertainty, and our desire for a more intimate knowledge of the beneficial properties of light depend still upon future research.

As the subject is a matter of considerable controversy, it would be futile to make any extravagant assertions until more lucid knowledge is brought to bear on the subject.

In the post-natal development of the Macula, light plays an all-important part. Light has a capillary attraction. This can be instanced in many ways. From the lowest forms of life to the most highly complex beings light acts as an attractive force, and all forms of life respond to it as a needle to a magnet. As to its attractive properties, have we not seen that when a plant is placed in a window the branches and foliage incline towards the source of light? All vegetable life responds to it, but deprived of it becomes dwarfed and anaemic.

The vitality that is imported and thus acquired is always lowered when the plant is placed in darkness. This is true, I submit, of all forms of plant life; without light the plant dies.

I will say further that the physiological activity of vegetable life is stimulated by light, but when absent is arrested.

The green coloring matter of the foliage assumes its natural hue of green under the influence of sunlight, but if deprived of it it quickly loses it.

The physiological activity in the animal kingdom is dependent upon light for the makeup of the constituents of the body, and the bacterial balance is maintained thereby.

As to the development of the Retina, and particularly the Macula, I make the assertion that, like many other functions, the Macula is not perfectly formed at birth, as to whether there is an inherent tendency to conform to its later arrangement I am quite ready to admit, but its entire development is not completed until some later period. And this completion depends upon and is brought about by the direct influence of light, and in the case of the Macula by refracted light being gradually brought to a focus on the Retina.

The eye of a newly born child, to say the least, is in a static condition and inert, and only assumes a dynamic function gradually after continual exposure to light. All the ocular functions depend upon this factor.

The first evidence of a response to light is a feeble contraction of the pupil and an increase of this contraction indicates the progress of retinal development and activity. We notice this reaction growing stronger as time goes by. This shows how little responsive the Retina is to light so far, and only by a very gradual process does it improve its functions, which take considerable time to attain full activity.

That the Retina shows no response whatever to light in a newly born child, though it is lying with its eyes open, can be shown as follows, that the motion of the hand before the child's eye causes no flicker, and is apparently unaffected by bright sunlight. Bright light brings no contraction of the pupils, which proves that the Retina at first possesses very little sensitivity, and, moreover, that as to their functioning Retina, Optic Nerve, and Brain Centres are not yet in co-ordination. It is necessary that there should be fibres in the transmission of an impulse, and it is obvious that in the sub-

ject referred to there is lacking the first response because the Retina is not yet able to receive the stimulus of light.

The adaptation of the pupil to contract is a gradual process and is in proportion to the development of the Retinal percipient elements and their co-ordination with the cerebral centers.

These explanatory remarks preface the way to the further contention that the development of the Macula is not complete at birth. This specialized area begins its development in the early stages of life, and is brought about by refracted light after passing through the dioptric system of the eye being focussed on an area of Retina first as a circle of diffusion.

Later, when the lens and ciliaries function more efficiently, this circle is contracted gradually until a true focus is formed in the case of a child, following an approximate focus on account of the eye remaining hypermetropic for some little time.

Let us remember that at this stage a very vital factor plays a part, that this point of refracted light acts as a powerful magnet to certain of the percipient elements. So far, I am assuming that at birth the structure of the Retina is not matured. That there may be a disposition inherited or an elementary plan outlined which is gradually built up during the succeeding months may be the case, and a few years may elapse before it attains full maturity.

The cones are thus brought into activity if not into actual being, their development being post-natal. In respect to the cones, these nerve endings, attached each to its respective nerve fibres, are either brought into existence or made to function by this refracted light, which, acting like a centrifugal force, causes them to be arranged paracentrally. Gradually, as the refractive condition, acting in conformity to the newly-acquired function of Retina, becomes more perfected, we have the true Macula formed—the highly specialized area where the cones preponderate in number over the rods.

It is not a mere coincidence that the cones are arranged around a limited area. It is beyond doubt that they are only formed on the portion of the Retina where light impinges and in the immediate vicinity.

In the peripheral area refracted light does not penetrate, or only by accident momentarily, and this portion is only usually exposed to reflected rays from the various surfaces.

The rods are distributed over the peripheral portion of the Retina. In the region of the Macula, they are few in number—on the other hand, there are only a few cones in the peripheral area.

As to the rods, I briefly mention that they are developed also by light, and as to their peculiar property and prerogative consists in light perception, their function is very much more limited than that of the cones.

That the paracentral arrangement of cones is due to mere chance is too absurd, and there being a cause and effect for everything, I feel justified in assuming that they owe this arrangement to impingement and attraction of light.

Although this is not a general dissertation on the physiology of vision, a few remarks on the early process will not be amiss. At birth I assume that the terminal end organs (which ultimately become rods and cones) bear the same characteristics at the time when the incidence of light first plays its part. After the refractive condition has progressed as already mentioned, the light thereby refracted is condensed and focussed on a limited area of Retina, and these primary elements are resolved into more complex nerve endings and assume more comprehensive functions not only of sensing light but form and color.

Another outcome that this condensed light brings about is that the cones are developed in proportion to the condensed light, and thus the higher specialized area is formed.

After undergoing exposure to light, these nerve endings developing upon similar lines for a time, assume secretory functions, of which one result is the visual purple, which, as we know, by a direct influence of light undergoes chemical change, setting up the necessary vibrations, the first step in the act of vision.

Also, the more condensed light becomes by refraction, the more numerous the cones, the greater the visual

acuity, and, consequently, the sensory stimulus to cerebral areas.

The Macula region and the area paracentral to it on account of the preponderance of cones possess the Light Sense, Form Sense and Color Sense in a remarkable degree, which does not apply to the more peripheral portion of Retina.

I place on record the contention that exposure to good light is absolutely essential to the development of Retina, and particularly the Macula. The future well-being of the eye, ciliary development, and strengthening of the tunics and functioning of Retina and sensory stimulus to the cerebral areas are all dependent upon the incursion of light into the eye in the very early stages of its existence. In its absence such deprivation will produce a general weakening of all the ocular functions.

I have assumed that the cones being developed after birth and owing their existence to light, if a child should not be exposed to light, the numerical growth of the cones would be retarded and restrained. Being terminal end organs, they depend upon the stimulation of light to start the cycle of events. The greater the number of cones the more proficient the Macula and the greater the sensory stimulus, which in its turn produces an equally powerful return reflex action to iris, ciliaries and extrinsic muscles.

The future vision of the man depends entirely upon the eye of a newly-born child being exposed to light.

To quote an extreme instance will prove how absence of light produces blindness. In the islands of Tierra Del Fuego there exists in the caves animals of a species absolutely blind, possessing eyes that see not, never having been exposed to light. A human being imprisoned in darkness will also become blind through non-stimulation of the ocular functions, particularly the Retina, which atrophies first.

That the opinion of scientists on the effect of light has been considerably revised is well known. It was previously thought that the elimination of certain rays would prevent certain pathological developments in the crystallized lens.

That idea has been confuted recently, and it is now assumed that without these particular rays the eye would lose the necessary stimulus.

In discussing any evolutionary subject we base our opinions on circumstantial evidence. That the deductions at which we arrive are conclusive and final no one has any right to assert, but that the way is thus made clearer in the attempt to unravel such a problem leads us to feel justified in forming opinions and treating such evidence as reliable and not as a matter of mere conjecture.

I have throughout this subject based my reasons on actual data. I may be excused for one or two minor suppositions, but my endeavor has been to avoid inexactitudes, even in a small degree.

I lay no claim to infallibility in my reasoning, for all so-called truth is but relative.

In all other animals except in the Simiae, parallel vision does not occur. With the flattening of the face we approach parallel vision, and the higher the order the nearer the visual axes approach parallel vision.

Parallel vision, with the power of convergence, only occurs in those animals which possess a true Macula, i. e., man and all the Simiae. This Macula exists in all the Simiae without exception and in no other Mammals. With the exception of this order, Mammals very rarely move their eyes, but move their heads instead. This fact deserves more than a passing interest. On account of an extensive area of rods and cones uniformly arranged throughout, the Retinal impression of objects viewed is the same over the whole of this area, and this arrangement, though not rendering the eye sensitive to perception of fine detail, is of greater value in such a way that moving objects are more quickly detected. Thus we have in the other Mammals a sense of perception higher than the Simiae possess, the Motion Sense. The animal can view a moving object, and particularly a distant one, in a more remarkable way, and this is accomplished without turning his eyes. As to the Simiae, it is necessary to continually move the eyes in order to bring the object on the Macula.

I will not digress by discussing binocular single vision as applied to animals. In most it does not occur, as the hare, which sees from both sides.

The great essential in the establishment of the Function Sense and bin-

ocular single vision is a perfectly functioning Macula. There are other, but subsidiary, conditions necessary for the maintenance of this function, the cerebral system must be fully developed, and this applies to those important bodies comprising the Primary Optic Ganglia, a vital part of the central nervous system. Also the Motor Nerves, which supply the extraocular muscles, must be intact.

That the governing factor is the Macula can be shown as follows:

The Macula bundle of nerve fibres represents from one-third to one-half the total number in the entire Retina. These transmit the impulses via the optic nerve tracts to the Primary Optic Ganglia after partial decussation at the chiasma.

The Primary Optic Ganglia presiding over the Ocular Motor Centers cause a reflex action to return by the Motor Nerves to the extraocular muscles and also the Sphincter of the Iris: thus we have one of the highest instances of reflex action directly due to the powerful influence of the Macula by means of which powerful nerve currents are transmitted to the Primary Optic Ganglia.

As we are fully aware that the pupillary reaction to light is consensual, so is the action of the extraocular muscles consensual and due to the same causes.

We must not forget that all motor reflex actions are caused by stimuli to sensory nerve endings, and as the cones in the Macula are innumerable we can easily imagine the powerful impulse conveyed to the central nervous system and a corresponding powerful reflex action in return resulting. By this we see that the movements of the eyes are under the control of the central nervous system and the Macula the steering wheel for all. Due to this combined mechanism we have presented a harmony of several functions, and upon their combined integrity the Fusion Sense results.

Overlapping of visual fields and binocular single vision are dependent upon all these co-operating.

It is said that the Fusion Sense is an acquired one and due to a sense of mental ability. I would modify this statement by saying that this mental acquisition is developed and dependent upon the gradual strengthening and awakening of the Macula function, and without the direct influence of the latter would never be developed. Under these conditions only do we have such a mental appreciation.

As to the muscular anomaly, which no doubt exists in many instances, this is overcome by the motor nerve innervation and the consequent exercise of these mucles enables them to be more balanced. An easy response results in producing harmony, except in gross instances of muscular imbalance.

In concluding these remarks, when the Fusion Sense is properly developed the muscular anomaly is finally overcome, but there must always be a continuous stimulus from the Macula to bring about the necessary motor response to the extraocular muscles.

Should there be an abeyance for a time the visual axes will depart from their normal relative directions when the eyes are at rest. It is interesting to note the consensual reaction of the eyeball movements when the refractive condition of one eye is highly defective. I have seen many cases of high myopia or hypermetropia in one eye, the other eye being normal, when convergence was equal, but when at rest the defective eye diverged considerably. Other contributory cases of departure from these conditions and tending to squint are, as is generally known, as follows:

Lack of mental control and if cerebral centers are not developed sufficiently, many of these cases frequently being hereditarily disposed. But it is not with these causes that I am dealing. I am throughout my reasoning emphasizing the one point that the Macula is the predominating factor.

The following anomalies of refraction I append to support my argument.

In correcting the ametropia in a case of squint we notice a gradual tendency for the visual axes to be readjusted (the eyes look straighter). The reason for this, I submit, is that when light is brought to a focus on the Macula it causes or renews the necessary impulse to the brain more intensely, resulting in the return reflex motor action to the extraocular muscles which had been only slightly innervated previously.

Numerous cases of High Myopia are characterized by a condition of divergent squint, perhaps, exophoria, the

Macula not being fully stimulated on account of light rays not being condensed sufficiently or falling upon another part of the Retina.

The motor equilibrium of both eyes is determined by the visual axes being maintained by fixation on each respective Macula. As a result the eyes are compelled to adjust their positions in order to fix the visual axes on the Maculae, whether in the act of convergence or adaptation to far objects.

In the treatment of squint, when, of course, the Macula function has partially or entirely lapsed, by correcting the refractive error and treating by suitable methods the Macula may resume its function if the visual axis is made to impinge upon it, and a resumption of the Motor equilibrium may be readjusted gradually. That squint occurs in cases particularly when the refraction is highly ametropic in both eyes from an early date is a fact, the Macula never having been properly developed, and in most cases of squint I submit the Macula factor.

When light falls in a circle of diffusion the vibrations caused are not great, but the consequent sensory stimulus is below normal.

As suggested previously, a low ametropic condition in one eye only, may only result in a tendency to Heterophoria, and is counteracted by the consensual reaction as previously mentioned. In the Simian family the eye movements are always necessary in order to bring the image of the observed object direct on to the Macula, and especially moving objects. This last reason is important, as otherwise the effect would be like gazing at a moving object down a tube, when the object would quickly pass out of the line of vision.

If it were possible to deprive the human eye of its Macula, instability of movement would result, because the control and steering factor being absent the mutual co-ordination of the whole of the extraocular muscles and their nerve innervation would be entirely wanting. This can occur in cases of degeneration of both Maculae. Muscular anomalies, instead of being overcome and their actions regulated by nerve innervation, would cause imbalance and marked strabismus conditions would result.

There are many instances in which the eyes are highly Ametropic, but where the muscular balance is, approximately, normal, since there may have been a good refractive condition enjoyed before the Ametropia was acquired.

By the act of convergence the Simian advanced a great stage, excelling all other mammals, and this achievement is an indication of great mental development, and thus we have portrayed a very great advance in the history of this family:

1. Development of Macula.
2. Improvement of refractive apparatus.
3. Movement of the Globe at will; and, last of all
4. Convergence,

all of which have depended upon the development and perfecting of the Macula, and all these results synchronizing with increased mental development.

Alternating squint occurs frequently in cases of high degree of hypermetropia, and is indicative of the acquisition and persistence of high hypermetropia throughout early life, which resulted in the Cerebral Centers not becoming balanced.

The condition and completion of mental balance depends all through upon a good refractive condition, and, more than all other considerations, upon a good functioning Macula.

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THE ACADEMY AND ITS WORK

Founded in 1920 by a small group of ethical optometrists interested in educational advancement, the American Academy of Optometry has grown both in size and prestige until today it occupies a unique position of influence in the profession, far beyond its years.

As Doctor Ryer so splendidly pointed out in these columns last month, this organization is non-political in character and is interested chiefly in bettering the store of refractive technic at the command of the optometric practitioner of today. This, these men believed, could best be done by a relatively small group of optometrists all of whom are willing to work upon the same problems and all of whom are willing to put time, thought and money into the matter of getting these problems solved.

Fellowship in the Academy is limited to optometrists whose practice is conducted in a purely professional way. In other words, an office practice with no advertising of any sort and with the customary fees which attend professional work. The proposed member must, to date at least, have served his profession in some more or less conspicuous educational way and must also have presented, upon invitation only, to the Chairman of the Academy, an original thesis on some subject of refractive technic not already covered in optometric literature. After the thesis has been reviewed by the Council of the Academy and accepted, the proposed member is invited to come before the Academy and deliver his thesis and receive his Fellowship Degree.

These theses are then published. The 1927 volume is now ready for distribution. It is in this way that the Academy functions, and while several slight changes are about to be made in the nature of receiving Fellowship this is in the main, the way the Academy will continue to function. Fellowships are granted upon invitation only.

Besides its educational work, we understand it has recently been suggested that the Academy enter on several other important activities. The first of these suggestions, writes our informant, is that the Academy establish a Commission to pass upon new Refractive Appliances which are constantly being submitted to the profession and to also pass upon and grade the various types of material now offered to the profession by the optical material manufactors. This is an extremely important and he believes a very needed piece of work, and we understand the Academy can have the

assistance of the technical laboratory staffs of two large Universities as well as the technical training of the members of the commission themselves to call upon in examining the material or equipment and verifying the statements and claims of the makers.

This, it seems to our informant, is becoming more and more necessary as the profession grows. For instance, several years ago a new tinted lens was offered to the profession. Much was claimed for this lens in the matter of absorbing glares, etc., yet careful laboratory analysis demonstrated that an ordinary ophthalmic lens would effect almost as much absorption as would this highly advertised product.

Unfortunately at that time the profession had nothing to go by except the statements made by those interested in the sale of these products and many practitioners were thus influenced to prescribe these lenses at a greater cost to both themselves and the patient. Had this academy commission been functioning at that time these claims could never have been made and the refractionists of the country—both ophthalmologists as well as optometrists—for both were so influenced—would have been saved the ignominy of being made ridiculous by mere sales propaganda.

And, too, writes our informant—of late a new piece of refractive equipment has made its appearance. This small instrument is made with a slight change—a decided improvement to be sure—over the one in use for years—yet the sales organization behind this piece of equipment has made several statements which are decidedly misleading, and which should never have been made as the new instrument requires the same measure of skill to operate as does the old and while the new is more accurate, the instrument should be sold only on its merits in this regard, not on the statement that no matter how deficient you are in the performance of this bit of technic that by using OUR instrument all will be well. This sort of talk must stop—and the American Academy of Optometry, he believes, should see to it that it does. Before a new piece of equipment or before a new type of material is offered to the profession the suggestion is, that it bear the stamp of approval of this non-interested commission whose sole effort will be to see to it that the material or instrument functions as specified and to clearly state its merits. All new therapeutic agents offered to the medical profession are passed upon in this way by a commission of medical specialists and the profession is spared much indeed by means of this small group, and in like manner he believes that Optometry needs the services of the Academy in this way as well.

Another proposed activity is the building up of an optometric library at one of the larger optometric schools. This library to form a permanent archives for optometric literature, with a librarian whose duty it will be to file papers, manuscripts and books and properly index them. The profession needs some sort of archives where at least one copy of each piece of printed material is on file. In this way the Academy could again be of vast benefit to the profession.

The American Academy of Optometry is having its annual meeting in New York City in December, where more than a hundred of the leaders of optometric thought will attend and we understand, a rather large group of practitioners will be admitted to fellowship. Optometry the world over is looking forward to this meeting, the Academy serving as a beacon light of progress—the professional development of Optometry being in its hands.

C. C. K.

CORRESPONDENCE

NYSTAGMUS

Withers Bagwell, Opt. D.
South Boston, Virginia

I recently published in the Optical Journal and Review what I thought at the time was a wholly innocent theory in regard to non-pathological nystagmus, but when Dr. Arthur Bush's criticism appeared a little later in the same publication condemning it so cordially it seemed I must have been mistaken,

but I felt the Journal's family of readers had seen my article as well as his and were in a position to draw their own conclusions about both papers.

The plot thickened considerably, however, when Dr. Bush's criticism appeared in the following issue of the American Journal of Optometry. I felt in the first place that to be accused of hurrying up suppositions, not by science but by something that looked like it; and to be told that I cared nothing for the difference between analogy and chance resemblance; that, for me, homology was fundamental identity; that my comparisons were preposterous, my conclusions inconsistent and contrary to logic, was bad enough, but to be thus damned to a family of readers who had not seen my contribution but had Dr. Bush's side of the case only, was distinctly a blow below the belt.

Because I used a very simple little illustration of a shot in a spherical bowl to indicate the movement of a retinal image and nothing else, he was horrified. Unless the illustration taught clearly also "complex anatomico-neurologico - physiologico - psychological" fundamentals of binocular vision, it was preposterous.

When he wonders why the nerve centers should be called on (or probably volunteer) to supply supplementary force to keep the retinal image moving across a "measurable area" all of which is equivalent to macula surface and any part of which would serve equally well as a fixation point, he has clearly overlooked a complex anatomico-neurologico - physiologico - psychological fundamental of binocular vision. It is not at all a question of demand for supplementary nerve force or any sort of a request of the optical system for a pair of swinging eyes, but conversely, the want of an adequate brake to keep the eye fixed. Probably one of the most necessary functions of the fovea centralis is its use as a veritable vise to hold the eye steady and firmly fixed against all adverse influences. All phorias are indisputable witnesses to the fact that in spite of the tug and traction of unbalanced extrinsic muscles, the fovea is absolute mistress of the situation and demands, and secures, sure and unswerving fixation—point fixation—esophoria, exophoria or hyperphoria to the contrary notwithstanding. Remove this fixation control and nystagmus seems to be the inevitable and logical result. I can conceive of no more plausible hypothesis. Witness also the restless, constant swinging of a pair of totally blind eyes. Why the supplementary nerve force to keep them in motion! And yet they swing and swing and swing.

Just why eyes indulge in these restless, pendulum-like motions when the control is wanting, I do not know. Neither do I know why a dog turns 'round several times before lying down. I only know them as facts that be, and Dr. Bush says facts are stupid things, in themselves, but even so they are rather difficult to dispense with.

Dr. Bush has a perfect right to differ from me and to publish his opposing views and should be commended for taking interest in his profession, but in view of the language he used, he should have confined his rather caustic remarks to the family of readers who had seen my contribution and not have flung it so wide among people who would read the criticism only.

SPECIAL REPORT

THE AMERICAN ACADEMY OF OPTOMETRY

By Eugene G. Wiseman, Opt. D., F. A. A. O., Chairman
Buffalo, N. Y.

For years there has been an increasingly insistent demand for an organization of Optometrists who not only talked professional ideals, but thought and acted them as far as is possible in Optometry today.

To meet this demand the American Academy of Optometry was formed. No fanfare of trumpets nor radio roar greeted the birth of this "young hopeful," nor has there been any broadcasting to popularize it or greatly to swell its membership.

Its organizers were content to let

the Academy idea grow by natural accretion. They did not want to create artificial interest or demand, for they knew, from previous history and experience, that interest stimulated by high pressure methods soon subsides

Now, however, American optometrists have had some fifteen years in which to nourish the seed with which they were impregnated in 1912, for it was then that the original Academy idea was launched by optimistic men And many of them are demanding the opportunity to rear and cultivate the ideals to which their aspirations have given birth.

This opportunity is best created by association with those similarly minded. The American Academy of Optometry is the answer.

The Academy is not seeking a large membership—indeed, its requirements preclude any such possibility—but its officials believe that those practitioners who have vainly sought association with men and women similarly minded ought to know that an organization of such has been effected and is functioning. In it are such men as Petry, Ryer, Hotaling, Doane, Hazel, Peckham, Andreae, Koch, Cox, Steinfeld and others.

To convey a more exact idea of the ideals and requirements of the Academy I can do no better than present as follows the annual address made by the writer at the 1925 meeting which was held in Buffalo.

It may be added, parenthetically, that in addition to the idea of mutual help and co-operation it is the intention of the Academy to conduct deliberate and purposeful scientific research as soon as its funds permit. That will probably be sometime during the next year.

Chairman's Address.

For twenty-five years after its more or less formal introduction to the public as a profession, Optometry made great progress. The typical practice of the nineties was characterized largely by very meager equipment and a rather sketchy conception of the depth and importance of the work. The work itself was conducted almost entirely in jewelry and optical stores. It was chiefly an adjunct to the main business of selling merchandise totally unrelated to the optical business and to optometric science.

This has evolved into modern optometry with its multiplicity of precise instruments and a much better understanding of the gravity of our vocation. Many have divorced it entirely from extraneous endeavors and some have sought surroundings more harmonious with the dignity of their vocation.

The technical education of its exponents has advanced from first hand instruction as apprentices under practitioners largely self-taught to our present day efficient schools and university courses.

Something like five years ago it became evident to some that Optometry was rapidly approaching a period when it would be necessary for the profession as a whole to adopt and proclaim a definite standard of practice below which one could not go and still be regarded as sincerely desirous of elevating our vocation to the professional level.

This belief became sufficiently widespread to justify the conclusion that the situation was rather critical and that Optometry had again reached a crucial stage in its development. Practically all of Optometry's exponents had voiced the belief that it was a profession in the common understanding of the term and therefore entitled to the same respect and consideration which was accorded the other professions. Yet many of these same men continued to perpetrate the grossest commercial practices and to violate all the ethics of professionalism which have been built up through the centuries. They approved of other practitioners adopting a relatively rigid code of ethics while they themselves proceeded to profit by the advantages in competition which this gave them. While the professional optometrist devoted himself largely to the development of optometric science, the commercial optometrist concentrated on the building of personal business, yet he often appropriated the improvements of the former and sometimes utilized them to the great discredit of Optometry.

Those who believed in scientific and professional progress and who perhaps took a long view of it preached their ideas and patiently waited for the leaven to work and gradually to transform the entire body optometric. They hoped and prayed that such transformation would evidence itself in sincere and open practical support of higher ideals, in harmonious gatherings where optometric science would be the dominant note and not individual aggrandizement, and in the selection of the higher type of practitioner as the official and actual leaders in state and national associations.

But as a whole they seemingly waited in vain. The same powerful interests which opposed, in spirit if not in action, scientific progress and professional advancement also opposed the elevated standards of progress and the higher code of ethics which it naturally implied and imposed. They at least rejected them by disdaining to live by them.

Such opposition still exists. It is repeatedly in evidence in our conventions and local gatherings. The caliber of many of those who deprecate advancement—their personal influence and the example of their big businesses—is such that the majority of those who attend such meetings acquiesce with them by silent affirmation if not by open approval.

For this reason the American Academy of Optometry was formed. Secretary Koch will tell you of the earlier history of this organization and its progress up to date,

and so it will not be necessary for me to dwell upon it. Its mere existence is illustrative of its need and the steps taken to satisfy this need.

However, the mere recognition of the need of the Academy and the actual formation of the Academy itself was and is not enough. The principles and purposes underlying the Academy are of basic importance. The physical association it permits is good but of more importance is the factor of spiritual communion. In order that ideal harmony might prevail by reason of carefully enunciated principles and carefully chosen personnel, it was necessary to decide just what ought to be the determining factors in both respects. Before presenting conclusions with regard to these, it will be well to review the situation as a whole as observed by those charged with the responsibility of inaugurating Academy ethics, rules and purposes.

As stated, it would be foolish to deny that optometry and optometrists have made progress. But with greater understanding have come greater obligations and the need for still greater progress. Optometry has grown through sheer power of youth. It has advanced in spite of itself. Furthermore, it has fulfilled a great need which existing agencies seemed unable to supply. We have no assurance that their inability will continue or that other more competent agencies will not come into being.

With its coming of age, Optometry has donned the habiliments of manhood but its voice is still too often the voice of youth. Indeed, it sometimes is the voice of childhood, and it is no wonder that older professions often refuse to acknowledge equality.

With few exceptions, perhaps, optometrists have loudly affirmed that Optometry is a profession. Well, Optometry in the abstract may be called a profession. In the concrete it sometimes is practiced as a profession. But in the main Optometry is conducted as a business and solely as a business, with the commercial side as a dominant side.

It is in this respect that Optometry faces greater obligations and the need for greater progress, not altogether for the sake of surface appearances but because outward manifestations both reflect inward qualities and tend to affect fundamental character. Let a practitioner believe in professionalism and strive to emulate professionalism, and, ergo, he soon becomes professional.

As I understand it, a profession, to put it briefly, is a vocation in which the chief remuneration is for services rendered by an individual who has been intensively trained for that purpose. A business is a vocation in which commodities are exchanged for money and separate fees for services are not charged.

It would seem, therefore, that Optometry, because it does dispense merchandise and often does command fees, is in an anomalous and incongruous position. In some cases it is conducted as a business and in others as a semi-profession. In still others in which the merchandise factor is greatly subordinated by the service factor, it is substantially professional.

After all, it is the spirit and the atmosphere surrounding the individual practitioner which denotes the character of the vocation.

Within the past few years an increasing number of practitioners have experimented with methods calculated to accomplish five major results:

1. Consistency with affirmation of professionalism.
2. Practice under conditions favorable to technical skill and scientific research.
3. Increased self-respect.
4. Meriting and earning the respect and confidence of the discriminating public.
5. Decreased expenses and increased revenue.

Their results, in conjunction with observation of the experiences of other professions, confirm them in the belief that, first, the practice of Optometry can be made professional; second, that a professional practice is most conducive to a higher degree of technical skill, resulting in better service; third, that self-respect and their respect for their profession rises as their skill advances and their surroundings become more consistent with their claims of professionalism; fourth, that the respect of the layman becomes increasingly manifest; fifth, that their expenses decrease and, usually, their income increases.

This is all self evident to the deeper students of optometric affairs in particular and professionalism in general. The fact that some men fail when they attempt a professional type of practice is no sound argument to the contrary because some men are not fitted to practice that way. The fact that more and more optometrists, some of them formerly uncompromising commercialists, are adopting professional practices and are enthusiastic about the results is conclusive evidence that the theory is sound.

But, until the formation of the Academy, these men did not have available a group in which they could feel entirely at home and free to express themselves with the confidence that they were in harmony with those around them. There was no group with whom they could associate with the assurance that they could learn from each as well as perhaps instruct each.

They could not very well discuss fees with men who charged no fees. They could not speak of the requirements of publicity with men who blazened out in crass display advertisements. They could not interchange ideas concerning the psychology of surroundings with men who conducted stores. They could not safely advance ideas and conclusions relative to their scientific work for fear that "store" men would seize them and prostitute them so as to bring discredit upon Optometry. They could not converse about technical subjects with even some of the best known and most prosperous optometrists in the country because they could not be sure that these men were either interested or had the slightest idea of what they were speaking. And often when their consultants went to distant cities they could not refer them to a particular individual because they could not be sure of the type of practice and service of that individual.

The organization of the American Academy of Optometry helps to solve all of these problems. The Constitution, By-Laws

and Fellowship Pledge will be read to you today. From these articles and from other sources during the next two days you will learn that the following written and unwritten rules and policies will tend to govern Academy procedure:

1. The three basic requirements for membership in the Academy are, (a) the candidate must practice in an office, (b) he must charge an examination fee of $3.00 or more, (c) he must not carry on what is known as display newspaper advertising, nor any of the less commendable forms, such as blotters, bill boards, hand-bills, etc.

2. Membership in the Academy is by invitation only.

3. Each candidate must have demonstrated satisfactorily to the executive council that he is sincerely desirous of raising optometric practice to the professional level and is thoroughly conversant with modern scientific procedure.

4. It is not permitted on the floor of the meeting to discuss subjects other than those relating to the scientific side of our work except during the period reserved for Academy business—and that time is short.

5. All discussion should be characterized by forbearance and modesty, as by those seeking truth and not as by those determined to impose their beliefs upon others without offering satisfactory evidence of the inherent merits of these beliefs.

6. No campaigning for office of any kind is permitted.

We realize that rigid insistence upon the requirements will keep out of the organization many practitioners who are very desirable from every other point of view. Some are very delightful gentlemen with whom association would be profitable in several ways. Others are just as highly competent as any who are eligible. But these men can all be met and associated with in existing organizations and there would be no reason at all in creating another group which merely duplicated those already at hand. It would surely deteriorate into something of like character and finally disband for lack of incentive and originality.

Many such bodies have waxed and waned. They have served little good purpose but have rather promoted discouragement. They usually stimulate interest at first but finally resolve themselves into vehicles for personal profit and prestige. They accumulate a type of member who is perhaps nondescript and who absorbs everything and contributes nothing.

We believe that in the Academy we have an opportunity to create something useful and unique, and we are confident that it cannot be made permanently valuable unless it has limiting requirements—some features which will definitely catalog its members beyond peradventure of doubt. While we do not say that those who do not meet our requirements are not competent or scientifically disposed or a credit to the profession, we do assert that those who can comply with our rules are more likely to contribute to the progress of optometry and to its permanent establishment in the mind of the public as a safe profession.

We do not believe that the public will acknowledge as a safe practitioner one who gives his services away. That would be contrary to reason.

We do not believe that the public will recognize as a scientist the man who does his work in a store and is frankly there to sell merchandise. That is contrary to custom.

We do not believe that the public will have great confidence in the practitioners who utilize display advertisements and other similar forms of publicity to "get business." Such methods violate standards of professionalism which other professions have been centuries in building up and in which the average thoughtful layman instinctively believes.

And neither do we believe that those who resort to such methods can develop the same quality of service and skill as they could otherwise.

Hence these requirements. They are higher than any other optometric organization has ever required. They may be too high. Time will tell. But we are very confident that there are enough men in the country who can comply with them and who wish to be associated with such a group to make the Academy a power as long as Optometry shall last.

In conclusion let me emphatically state this: All should thoroughly understand that while we disapprove of the atmosphere surrounding the usual optometric convention we are not in opposition to any other optometric association. In the Academy we seek for those things which we have been unable to find elsewhere and in it we endeavor to avoid some other things too commonly found in other gatherings. But we believe that these other gatherings serve an important purpose, that they should continue, and that the Academy members should contribute to their success to any reasonable extent within their power.

HEAD-OF-THE-LAKES OPTOMETRIC ASSOCIATION

Dr. E. H. Kiekenapp of Fairibault, Minnesota, National Secretary of the American Optometric Association, was the speaker at the first Fall Meeting of the Head-of-the-Lakes Optometric Association. He explained in some detail the plans of the A. O. A. and also brought the Society assurances of additional activities in all departments of the National Association's work.

A. R. Burquist, Opt. D.,
Secy.

ILLINOIS OPTOMETRY INSPECTOR ACTIVE AT PEKIN

During the county fair at Pekin a local optometrist, observing a violation of the law, wired Chief State Inspector John Follmer of Chicago, who instantly telegraphed the field inspector at Pekin, who that same afternoon arrested three peddlers who had been selling eye glasses among the crowds at the fair grounds without the proper state license. A conviction promptly followed in all of these cases.

REPORTS AND ANNOUNCEMENTS OF SOCIETIES

Official Organ of the Delaware, Iowa, Maryland, Minnesota, Nebraska, North Dakota, Oklahoma, and Vermont Optometric Associations.

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Dr. M. B. Meyer, Wilmington, Del.

MAINE ASSOCIATION OF OPTOMETRISTS MEETING

The last meetings of the Maine Association of Optometrists and the Woman's Auxiliary were held at the Conduskeag Canoe and Country Club in Hampden, Maine, on Wednesday, the 14th of September.

It was voted that the Constitution and By-Laws be amended to read that the Annual Dues be $15.00 instead of $10.00.

The Association unanimously adopted the resolution represented at the Washington Convention "that all Optometrists use only the word 'Optometrist' in designating his or her profession and that this word be used exclusively."

It was also voted that money be alloted to the Maine Board of Examiners in Optometry to become members of the National Board of Examiners in Optometry. This money to be drawn from the Association's Treasury.

MICHIGAN STATE ASSOCIATION CONVENTION

The thirty-first annual convention of the Michigan State Association was held September 20 to 22, inclusive, at the Scott Hotel at Hacock, Michigan.

Dr. C. J. Howe, the president of the Association, delivered the annual address at the opening of the convention. He recounted the activities of the organization during the year. Dr. Howe called particular attention to the fine work of the State Optometric Inspector Dr. Glazier and cited some cases where he obtained an arrest, conviction and sentence of optometry law violators all on the same day.

Dr. Howe also praised the work of the legislative committee in blocking the attempt of some Osteopaths to secure legislation which will exempt them from the Optometry Act. Drs. Springborg, Hipp, Eimer, Morris, Arnold, Ohlson and Glazier appeared with Dr. Howe before the Public Health Committee and before the Governor advancing arguments why Osteopaths should not be exempted from the Optometry Act, with the result that the optometry amendment as presented by the Association legislative committee passed both the House and Senate and was signed by the Governor.

Dr. Ernest Eimer, secretary of the Association delivered his annual report and pointed out the improvement in the financial condition of the Association since the annual dues were raised to $15.00 a year. He also reported an increase in membership during the year.

During the banquet Dr. Eimer, after delivering an eloquent address, presented Dr. Peter Scholler with a beautiful watch and chain as a token of appreciation for the wonderful and faithful services he rendered optometry during the last thirty years.

American Journal of Optometry Adopted as Official Organ.

During the business meeting the membership voted unanimously to adopt the American Journal of Optometry as the official organ of the Michigan State Association of Optometrists and to have the Association furnish the American Journal of Optometry to the entire membership. The cost of subscription to be paid out of the Association treasury.

Election of Officers.

The following officers of the Michigan Society of Optometrists were elected for the coming year: Glenn F. Smith, president, Grand Rapids; Ernest Eimer, secretary, Muskegon; Glenn C. Hill, treasurer, Detroit.

Administrative Department—Charles Van Sluyters, Grand Rapids, first vice-president and chairman of administrative department.

Educational Department—Clifton DeGraff, Monroe, second vice-president and chairman, educational department.

Department of Clinics—Chauncey J. Howe, Hillsdale, third vice-president and chairman, department public clinics.

Audit and Finance—Jay G. Davenport, Battle Creek, fourth vice-president and chairman audit and finance department.

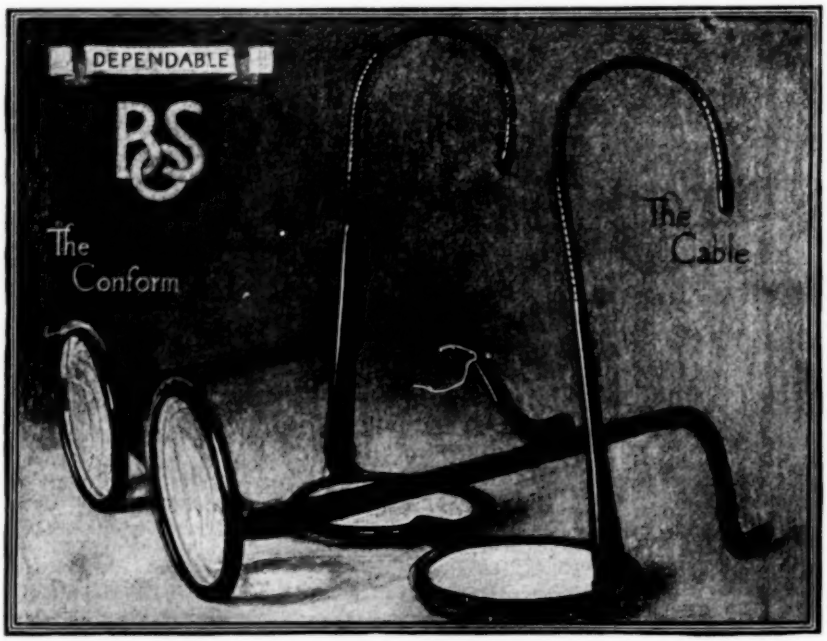
Michigan Optometrist—Editor, Emil H. Arnold, Ann Arbor; associate editors, Peter Scholler, Hancock; Gustave Ohlsson, Detroit; William E. Hipp, Detroit; Chauncey J. Howe, Hillsdale; Clifton DeGraff, Monroe.

ANNUAL MEETING OF CHICAGO SOCIETY

The annual meeting of the Optometric Society of Chicago was held on September 23, at the La Salle Hotel. The following officers were elected for the ensuing year: Drs. Harry Pine, president; Milton Fitch, vice-president; George A. Rose, secretary; George A. Bare, treasurer.

After a spirited election in which nine candidates were nominated, the following five received the highest vote and constitute the executive committee: Drs. E. G. Tavs, chairman; C. M. Scherer, M. C. Foust, W. Chaney, O. H. Bersch.

Dr. Pine appointed the education committee with instructions to get the best available for the coming season, this committee including Drs. R. J. Vallier, chairman; A. C. Gray, C. M. Scherer.



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JUST as certain outstanding people are recognized by their form and poise—so are Princeton Zylo Frames.

It is not even necessary to look for the words "B. S. O." and "Princeton" inside the rounded end pieces to prove them genuine because the quality that is exclusively Princeton stands out like good breeding.

And, like well bred people, Princetons wear well because the elements which constitute good wear have been built into them.

If you have not already proven this to your satisfaction just quietly make the experiment on your next patient—you will find that he will recognize the difference and appreciate it.

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